RESEARCH ARTICLE

Estimating the Ephedrine Hydrochloride and Olanzapine Simultaneously in their Pharmaceutical Forms (Tablets) by Derivative Ratio Spectra Method

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ABSTRACT

Ephedrine and olanzapine drugs have been simultaneously estimated by applying the derivative of ratio spectra method. It appeared that the method is rapid, sensitive, accurate and does not need beforehand separation of components to solve the great overlapping among spectra. After setting titration curves for ephedrine and olanzapine, it was found that the scope of the concentration for both drugs was between (6–24 mkg.ml^{-1}). It was also found that recovery ranged between (100.14 - 100.54) and (100.89–102.32), and values of relative standard deviation (RDS %) (0.2346–0.5736) and (0.1245–0.6404). ER% values reached between (0.0051–0.3300) and (-0.0700–0.02013) for both drugs respectively.

The method was applied on some pharmaceutical preparations, and it was found that it was salutary well, which makes the method applicable for drug production companies.

Keywords: Ephedrine, Olanzapine, Derivative ratio spectra, Great overlapping among spectra.

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INTRODUCTION

Ephedrine and olanzapine drugs are scientifically called

- (hydrochloride methylamino -1- phenyl propane -1-01-2) and
- Benzodiazepine 2-methyl 1-4-(4- methyl -1- piperazinly)-10H- thieno(2,3-b) (1,5) respectively; as the first drug is used for cases of respiratory diseases as dilator.[1,2]

It also used for Wight reduction and athletic performance improvement.[3] The second drug is used for certain patients suffering from depression.[4] Figures 1 and 2 shows the chemical composition for both drugs, respectively.

Due to the medical importance of these two drugs, a new spectral method was developed to determine them to be together simultaneously. Derivative rate spectra was useful in solving interference that occurred between the two drugs, which cannot be solved by the normal UV spectroscopy and without advance separation for the two drugs.[5,6] thus, this method is quick, easy, not expensive and suitable for analyzing. It is also important for bulk, accurate analysis and can be useful for determination of more than four mixtures simultaneously.[7] This method was used even though several methods are available to determine the two drugs accurately and reliably; for example by chromatography,[8] Ion aggregation and using the first, second, third and fourth spectrum derivative by their unique and mixed aspect[10-12] benefiting from electric migration method.[13,14] The purpose of carrying out this research is to determine the two drugs simultaneously when they exist together without doing advance separation, which would cost the lab our time and money.

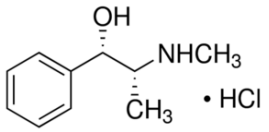

Figure 1: Chemical for ephedrine hydrochloride

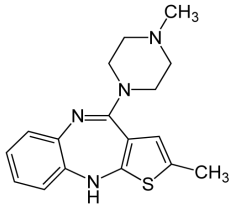

Figure 2: Chemical composition for the olanzapine

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PRACTICAL PART

Devices

- Spectroscope/Shimadzu UV-Vis, biradial of Japanese origin, model 1800.
- Dissolving device by ultrasonic waves–type Lab Tech, Korean origin.
- Sensitive balance, type Sartorius–Germany.

Absorption spectra were written down, unique and mixed, for the two drugs within a wavelength 200–350 nm, medium scan speed, sampling interval 0.1 nano and slit width 2 nano and by using 1 cm of quartz cells.

Solutions

6oo mkg/mL by dissolving 0.06 of both drugs (supplied by the State Company of Drugs Industry and Medical Appliances (SDI) Samarra, Iraq) separately in the least amount of methanol, the volume was completed to the mark by using the same solvent in a 100 mL volumetric flask. Then, a Solution of 50 mkg .ml^{-1} concentration was prepared in a 50 mL volumetric Flask from each pharmaceutical preparations from both drugs after solutions being filtered by using Whatman filter paper no. 40 to get rid of any planktons before usage; the following are some of the preparation used.

- Ephedrine HCI, 8 mg tablet
- Ephedrine
- Olanzapine
- Olanstad 10,

Mode of Action

Simultaneous quantitative determination for both drugs mixture:

1. A series of 10 mL volumetric flasks was prepared to contain various ephedrine amounts (60–240 mg); each flask also contained 50 mg of olanzapine. The volume was completed to the mark by the solvent used. The absorption spectrum was written down for each concentration of ephedrine against the formal solution.
2. By the same first way, a series of volumetric flasks were prepared, but the various-amount drug was the olanzapine (60–24 mg), while the constant-amount interfering drug was ephedrine 150 mg.

RESULTS AND DISCUSSION

Absorption Spectra

Figure 3 shows the absorption spectra for drugs under the study and for a mixture of them as (a) represents an absorption spectrum of ephedrine hydrochloride (15 µg.mL^{-1}); it seems that its greatest absorption is at 212.2 nm, and (b) absorption spectrum of olanzapine (10 µg.mL^{-1}) and showed the highest absorption at 226.7 nm, and (c) absorption spectrum of both drugs mixture (10-15 µg.mL^{-1}) respectively Figure.

Ratio Spectra Derivative Method

By noticing the absorption spectra of the two drugs in the form of a mixture we see the considerable interference as it is not possible to solve such an interference by ordinary methods like color methods.[12] therefor we adopted, in this work, the ratio spectra derivative method to solve this interference without pre-separation.[5,6]

The method included taking a series of 10 mL volumetric flasks Containing different concentrations of ephedrine hydrochloride

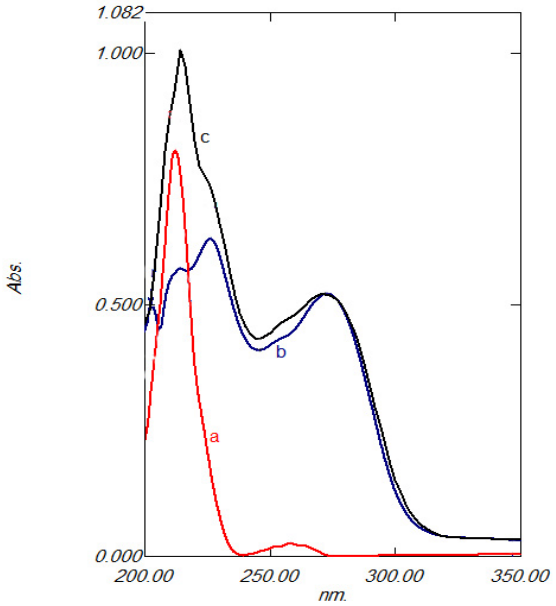

Figure 3: absorption spectra for both drugs and mixture of the two, as (a) absorption spectrum of ephedrine hydrochloride (15 µg.mL^{-1}), it seems that its greatest absorption is at 212.2 nm;
(b) absorption a spectrum of olanzapine (10 µg.ml^{-1}) showing the highest absorption at 226.7nm; (C) absorption spectrum of both drugs mixture (10 -15 µg.ml^{-1}) respectively.

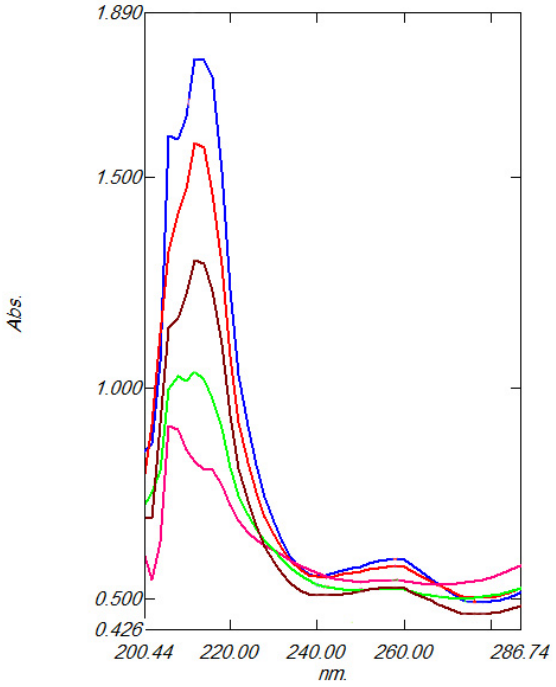

Figure 4: division result for the mixture expectra (6-24µg.mL^{-1}) ephedrine and (5 µg.mL^{-1}) olanzapine)) on the absorption spectrum of the interfering constant- concentrated olanzapine (5 µg.mL^{-1})

to be determined with a constant amount of the other drug, which is regarded to be interfering, its concentration was L^{-1} absorption spectrum of each mixture was written down at the best circumstances such as scan speed, change rate and slit width. Then it was divided on the drug absorption spectrum that considered interfering (impurity) of 5 $\mu g.mL^{-1}$ concentration. After obtaining the division results it would be derived, as the second derivative was useful and it depended on Peak to baseline, Peak area and Zero cross'. Calculations being done, calibration curves were built for ephedrine drug; it was found that the scope of concentrations which comply to Ber-Lambert Law was (6–24 $\mu g.mL^{-1}$) Figure 4 shows the division result of the mixture spectra on the absorption spectrum of the fixed. Concentration, interfering olanzapine; Figure 5 also shows the spectra of the second derivative for the division's result pertaining to ephedrine drug in the same way olanzapine drug was determined, though the constant drug's concentration of ephedrine was 15 $\mu g.ml^{-1}$; and by using the third derivative, it was found that the range of concentrations for olanzapine was (6–24 $\mu g.mL^{-1}$). Figure 6 shows the result of dividing the mixture spectra on the absorption spectrum of the constant-concentrated ephedrine. Figure 7 shows the spectra of the third derivative for the division result pertaining to the olanzapine.

Calculations and calibration curves

After doing the statistics calculations for the proposed manners by the analysis characteristics and the best conditions, it was found that calibration curves for both drugs comply to Bear Law at (6–24.mg.mL^{-1}) Linking values within the readings reached (09985-0.9995), and Detection limits values ranged (1.4580–2.5929) for the readings measure, as shown in Table 1.

Accuracy and Conformity

Accuracy and conformity for DDRS -DS method was verified, which was adapted to determine these two drugs ephedrine and olanzapine at the best conditions, as Table 2 shows the values of percentage of the standard deviation RSD%, and they were (0. 2346–0.5736) and (0.1245-0.6404) while the percentage of the relative error was (0.0051–0.3300) and (0.0700–0.2013) for both drugs respectively.

Method Application

The method was applied on a number of pharmaceutical preparation, it was found that the method was salutary in good way for direct determination of both drugs , as several

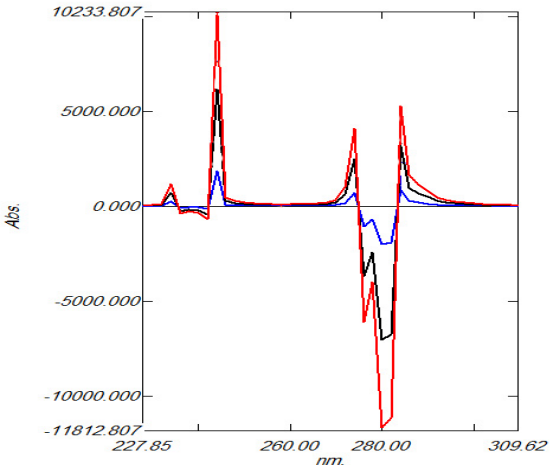

Figure 6: division result for the mixture spectra (6-24 $\mu g.mL^{-1}$) olanzapine and (15 $\mu g.mL^{-1}$) ephedrine) on the absorption spectrum of the interfering constant - concentrated ephedrine (15 $\mu g.mL^{-1}$).

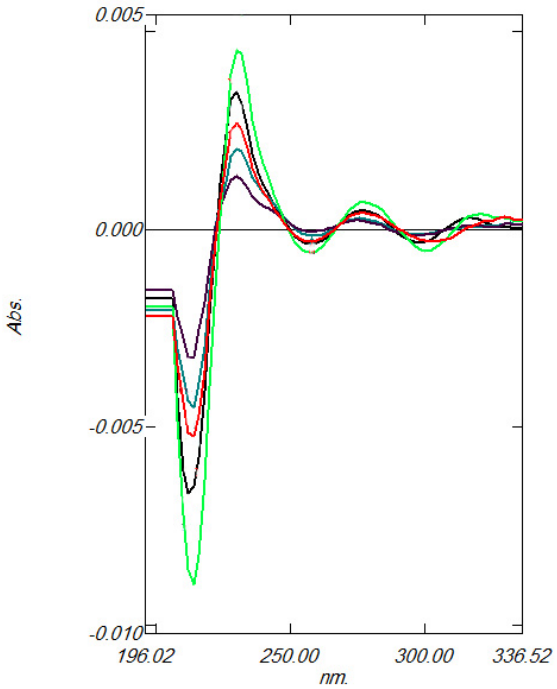

Figure 5: second derivative spectra for the division result of ephedrine drug by various concentrations (6-24 $\mu g.mL^{-1}$).

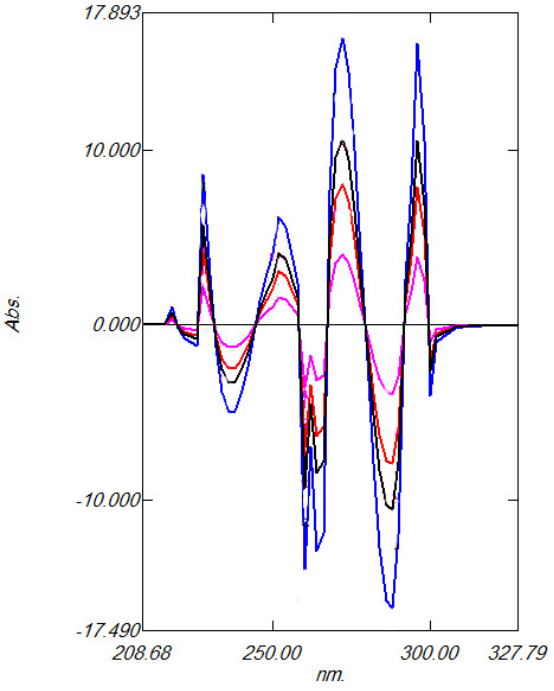

Figure 7: Spectra of the third derivative for the division result pertaining to ephedrine drug by various concentrations (6-24 $\mu g.mL^{-1}$).

Table 1: analysis results for the two drugs ephedrine hydrochloride and olanzapine by applying the DDRS-DS method

Compound	*Order of derivative*	*Mode of calculation*	*λ(nm)*	*Regression equation*	R^2	*D.L.* $\mu g.ml^{-1}$	*L.O. Q* $\mu g.ml^{-1}$
Ephedrine hydrochloride drug	Second	Peak to base line	214	y = -0.0004x-0.0004	0.9985	-2.5929	-7.8574
		Peak to base line	230	y= 0.0002x+0.0003	0.9995	1.4580	4.4184
	Third	Zero cross	267.2	y= 0.6889x-0.0908	0.9986	2.5443	7.7102
		Peak- to-base line	271.9	y= 0.6905x-0.1529	0.9991	2.0309	6.1542
Olanzapine drug		Peak- to-base line	287.9	y=-0.6853x+0.1129	0.9992	-1.9527	-5.9174
		Peak to Peak	268-278	y = 2.6942x-0.7004	0.9989	2.3004	6.9709
		Peak to Peak	282-288	y=-0.4198x+0.4885	0.9989	-2.4138	-7.3146

Table 2: Accuracy and conformity calculation for the analysisresults of drugs ephedrine and olanzapine by the proposed work methods

Compound	*Method of analysis*	*Taken* ($\mu g.mL^{-1}$)	*Fond ** ($\mu g.mL^{-1}$)	*Relative error %*	*Relative standard deviation %*
Ephedrine hydrochloride drug	Second order (peak-to-base line) at 214nm	10	9.9703	0.2966	0.2691
		13	13.0006	-0.0051	0.5736
	Second order (peak-to-base line) at 230nm	10	9.9670	0.3300	0.2346
		13	12.9673	0.2512	0.2391
Olanzapine drug	Third order (Zero cross) at 267.2nm	10	10.0070	-0.0700	0.6404
		13	12.9806	0.1487	0.1245
	Third order (peak area) at 268-278 nm	10	10.0201	-0.2013	0.5286
		13	12.9819	0.1391	0.1335

* Average of four determinations.

Table 3: Determination of the two drugs ephedrine hydrochloride and olanzapine in some pharmaceutical preparations by the proposed method

Pharmaceutical preparation	*Method of analysis*	*Labeled amount mg/tablet*	*Found amount mg/ tablet*			
			*Mean value**	*RSD%*	*E%*	*Rec%*
EPHEDRINE HCl, 8mg. tablet (4EVER FIT. Canada).	Two order (peak to base line) at 214nm	8	8.0433	0.7239	-0.5416	100.54
Ephedrine Hydrochloride, 30mg. tablet (WOCKHARDT. UK).	Two order (peak to base line) at 230nm	30	30.0430	0.6181	-0.1433	100.14
Olanzapine, 10mg. tablet. (TAJ PHARMA. India).	Three order (peak to base line) at 271.9nm	10	10.1323	0.5064	-1.3233	101.32
	Three order (peak to base line) at 287.9nm	10	10.2323	0.4703	-2.3233	102.32
Olanstad10, 10mg. tablet. (STAD. Germany).	Three order (zero cross) at 267.2nm	10	10.0890	0.9911	-0.8900	100.89

Table 4: Comparison of the proposed method results with the results of other methods

Drug	*method*	*R.S.D%*	R^2	*R.E%*	*L.O.Q* $\mu g.ml^{-1}$	*D.L.* $\mu g.ml^{-1}$	*Rec%*	*Ref.*
Ephedrine hydrochloride drug	Derivative spectrophotometric	6.9888	0.9978	-2.9444	0.5774	0.1905	–	12
	Spectra of different concentrations	0.6470	–	–	–	24.868	–	15
	Derivative of ratio spectra method *	0.7239	0.9995	-0.5416	4.4184	1.4580	100.54	
Olanzapine drug	Derivative spectrophotometric	4.0273	0.9997	-2.3889	0.0544	0.1649	–	12
	HPLC method	2.0000	–	–	–	–	102.00	16
	Derivative of ratio spectra method *	0.9911	0.9986	-0.8900	7.7102	2.5443	100.89	

* Proposed modalities

applications of. It like Peak to baseline and Zero cross) . Table 3 shows the results of analysis.

Comparison of Method

The method had been compared through the results obtained with other methods, and it was found that the proposed method was accurate and sensitive good enough as it is reliable in the quantitative analysis. Table 4 shows the method results with the results of other methods.

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